APPENDIX F

QUALITY ASSURANCE PROJECT PLAN (QAPP)

REVISED DRAFT

QUALITY ASSURANCE PROJECT PLAN FOR SOIL, SEDIMENT, AND SURFACE WATER MONITORING AT THE WHITE KING / LUCKY LASS MINES SUPERFUND SITE

Revision -0-

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1.0 PROJECT DESCRIPTION

1.1 Purpose

This Quality Assurance Project Plan (QAPP) was prepared for the White King / Lucky Lass Mines Site by Golder Associates Inc. (Golder) to support field investigation activities associated with remedial design and biotic investigations. This QAPP provides procedures for making accurate measurements and obtaining representative, accurate, and precise analytical data.

1.2 Site Description

A description of the White King / Lucky Lass Mines site is provided in Section 1 of the Remedial Design Workplan.

1.3 Sampling Program Design

The sampling locations and frequency, sampling procedures, and analyses to be performed are presented in the Remedial Design Workplan and the White King Pond and Augur Creek Study Workplan.

2.0 PROJECT ORGANIZATION

2.1 Organizational Structure

The organizational structure for management, quality assurance, and field activities for the White King / Lucky Lass Mine site is established in Section 2 of the Remedial Design Workplan. Contact information for Golder Project Management and a synopsis of duties for each organizational element are provided as follows:

	Project Manager
Contact:	Lee Holder
Company:	Golder Associates Inc.
Address:	18300 NE Union Hill Road, Suite 200
	Redmond, Washington 98052-3333
Telephone:	(425) 883-0777
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E-Mail:	lholder@golder.com

Project Manager

The Project Manager is responsible for planning and executing all environmental sampling and analysis and for preparation of analytical data reports, including submittals to EPA. The Project Manager identifies the specifications for, and administers the subcontracts for laboratory analysis. He also provides information to guide regulatory requirements and reviews aspects of Quality Control requirements. Workplan tasks, referenced method quantitation limits, regulatory compliance levels, and other pertinent documents are reviewed and assessed to determine if data quality objectives are being met.

Principal-in-Charge

The Principal-in-Charge will provide high-level management oversight, senior review, and quality control for the project. He will ensure that the necessary resources are available for successful project execution.

Health & Safety Officer

The Health and Safety Officer is responsible for developing the site Health and Safety Plan (HASP) and communicating the key elements of on-site safety to the field personnel, including personal protective measures and equipment, emergency preparedness, and incident protocol.

Remedial Design Task Leader

The Remedial Design Task Leader is responsible for engineering services required for remedial design activities associated with the White King / Lucky Lass site.

White King Pond and Augur Creek Study Task Leader

The White King Pond and Augur Creek Task Leader is responsible for determining the ability for White King Pond to support aquatic life and the potential for bioaccumulation of contaminants of concern by biota within White King Pond. Related objectives include quantifying the biologic community, and evaluating the effect of pH neutralization on White King Pond. In addition, the task leader will be responsible for pre-remedial action baseline sediment chemistry data collection for Augur Creek.

Chemist/Validator

The Chemist/Validator reports to the Project Manager and task leaders. He/she is responsible for coordinating with the offsite laboratories to obtain required analyses, and for sample tracking, chain of custody, and other sampling and analysis documentation. The Chemist/Validator maintains the data center files, including tabulating, compiling, and archiving data. The Chemist/Validator is responsible for the review and validation of laboratory analysis reports.

Field Sampling Personnel

The Field Sampling Personnel report to the task leaders. The Field Sampling Personnel are responsible for collecting all field samples in accordance with the QAPP and the Remedial Design Workplan and the White King Pond and Augur Creek Study Workplan. In addition, the Field Sampling Personnel are responsible for assembly, organization, and maintenance of all information collected during field activities (including sampling logbook, daily activity logbook, chain-of-custody forms, and field measurements).

2.2 Use of Subcontractors

Qualified laboratories will be retained for standard and specialized chemical tests on soil, water and invertebrate tissue samples as appropriate. Contract laboratories for chemical analysis will have a Quality Assurance Program that conforms to applicable guidelines in documents such as EPA SW-846, EPA QAMS-005/80, EPA QA/G-5, and ISO/IEC Guide 25.

3.0 DATA QUALITY OBJECTIVES

A primary objective of the field sampling activities is to provide analytical data that is of known and defensible quality. Tables QAPP-1.1 through QAPP-1.5 list typical chemical parameters defined for water, and soil/ sediment sampling that may be of interest during the site RD phase. The list of potential organic parameters may include semi-volatile organic compounds, and pesticide/PCBs from the Target Compound List (TCL) of parameters in the *USEPA Contract Laboratory Program Statement of Work for Organics* (EPA, 1999). The list of potential inorganic parameters may include metals from the Target Analyte List (TAL) parameters in the *USEPA Contract Laboratory Program Statement of Work for Inorganics* (EPA, 2000), and selected general chemistry parameters. Benthic macro-invertebrate organisms will be identified during the taxonomic identification task, which requires a sorting and enumeration process. As such, the confirmation of a variety and number of organisms is variable and they will not be enumerated in this document. Constituents will be analyzed using methods as defined in SW-846 (EPA, 1986) and *Standard Methods* (APHA, 1989) as applicable.

The objectives for analytical data quality are defined in terms of the quantitation limits achievable using the referenced analytical methods, and in terms of the resulting goals for precision, accuracy, representativeness, completeness, and comparability of analytical data. Quantitation limits are provided for each analytical parameter in Tables QAPP-1.1 through QAPP-1.5 and are cross-referenced to applicable standard EPA reference methods. The quality objectives established for remedial design are as follows:

- Precision: analytical precision will be reported as required by the governing EPA reference methods cited in Tables QAPP-1.1 through QAPP-1.5.
- Accuracy (Bias): accuracy will be reported as required by the governing EPA reference methods cited in Tables QAPP-1.1 through QAPP-1.5.
- Representativeness: Goals for sample representativeness are addressed qualitatively by the sampling locations and intervals defined in the Workplans. In addition, the use of standard procedures for sample acquisition (as described in Section 4 of this QAPP) will facilitate the collection of representative data.
- Completeness: Completeness is defined as the percentage of valid analytical determinations with respect to the total number of requested determinations in a given sample delivery group; completeness goals are established at 90%. Failure to meet this criterion will be documented and evaluated in the data validation process described in Section 6 of this QAPP, and corrective action taken as warranted on a case-by-case basis.
- Comparability: Approved analytical procedures will require the consistent use of the reporting techniques and units specified by the EPA reference methods cited in Tables QAPP-1.1 through QAPP-1.5 in order to facilitate the comparability of data sets from sequential sampling rounds in terms of their precision and accuracy.

4.0 SAMPLING AND OTHER FIELD PROCEDURES

4.1 Selected Procedures

Technical procedures have been developed to support sampling activities, data validation, and other technical activities. A list of technical procedures applicable to individual activities that may be employed at the sites is provided in Table QAPP-2.

Technical Procedures are provided as guidance to technical personnel and as such, require the specific circumstance of application or the knowledge of the field scientist to appropriately apply the guidance criteria. Some technical procedures may have duplicate or similar information provided in other technical procedures that is nevertheless necessary to provide continuity to the content of the document.

4.2 Variation Request, and Change Control Considerations

Variations from established field procedure requirements may be necessary in response to unique circumstances encountered during sampling activities. Field Sampling Personnel are authorized to implement non-substantive variations based on immediate need, provided that the Project Manager is notified within 24 hours of the variation, and appropriate documentation of the change is executed.

4.3 Sample Quantities, Types, Locations, and Intervals

Sample quantities, types, locations, and intervals for the surface water, sediment, and benthic macro-invertebrate sampling will be as specified in the applicable workplan. Field quality control samples including field blanks, field duplicates, and field split samples will be included in the minimum quantities specified in Section 7 of this QAPP or as specifically stated in the governing technical procedure or ASTM procedure. In the case of benthic macro-invertebrate sampling, the field QC will be limited to collection of replicate samples as a way of assessing the precision of the sampling effort (ASTM E2122-02). Appropriate documentation of the purpose of each sample will be maintained in the field log, and identified by the assigned sample designation; copies will be separately provided to the data validator as necessary (see Section 6 of this QAPP).

4.4 Sample Designation and Labeling Requirements

Sample labels will be attached to each sample container with an assigned field sample number, applied in a chronological sequence during the field activities. One number designation will appear on each sample bottle or container for a unique sample, regardless of the number of bottles and containers collected to represent the multiple analyses to be performed. This will ensure that field samples will remain unambiguously associated with the corresponding field locations. Information on the label will include the following:

- Golder Associates project number
- Sample designation number
- Analytical tests to be performed
- Appropriate preservation steps

- Samplers initials
- Date and time of sample collection.

The sample designation number will be cross-referenced in the field notes to identify the collection location, depth, and other unique sample collection information.

Each sample bottle will identify the laboratory analysis to be performed both in writing on the container, by reference to the container size, and/ or the label attached by the laboratory identifying the preservative added for the appropriate analysis. Number designations and assigned laboratory analyses will be recorded on the field report forms shown in the applicable sampling procedures, as well as on the chain of custody/sample analysis request form supplied by the analytical laboratory.

4.5 Sample Container Type, Volume, Preservation, and Handling Requirements

All sample containers, container preparation services, preservatives, trip blanks, and sample coolers will be provided by the analytical laboratory as part of their agreement for services. If Agency oversight sampling and analysis is to be performed, the Agency representative and their designated laboratory will be responsible for providing sample containers unless arrangement is made with Golder to provide sample containers. Sample container type, volume requirements, preservation requirements, and special handling requirements for the potentially required analyses are listed by analytical category in Table QAPP-3 for water matrix, and in Table QAPP-4 for soil matrix. Special handling and preservation requirements for the macroinvertebrate sampling and tissue preparation for analytical testing are provided in the ASTM Standard document (ASTM E2122-02).

Samples for geotechnical testing will be handled, contained and preserved in a manner specified in the governing ASTM or technical procedures.

All samples will be sealed, labeled, properly identified, and submitted to the analytical laboratory under formal chain of custody requirements as described in Section 4.6 of this QAPP.

4.6 Chain of Custody Considerations

All samples obtained during the course of this investigation will be controlled as required by procedure TP-1.2-23 *Chain of Custody*. Chain of custody forms (see Exhibit C in TP-1.2-23) will be completed for each shipment of samples as described in the procedure. Sample analysis request forms supplied by the analytical laboratory or chain of custody forms will be completed instead of Sample Integrity Data Sheets; such forms will specifically identify the applicable reference methods specified in Tables QAPP-1.1 through QAPP-1.5 as appropriate for each individual sample. All laboratory sample tracking procedures will ensure traceability of analytical results to the original samples through the analytical method referenced on the chain of custody and the laboratory applied tracking number. Each laboratory applied tracking number will be traceable to a unique sample designation number as specified in Section 4.4.

4.7 Sampling Equipment Decontamination

All non-dedicated sampling equipment which comes in contact with sample will be thoroughly cleaned prior to each sampling event to prevent cross-contamination between samples and to ensure accurate representation of analytes of interest in each sample interval. Personnel performing

decontamination will wear rubber gloves, face or eye shields, and such other safety equipment as directed by the project-specific Health and Safety Plan. Samplers and sampling tools will be disassembled as necessary and placed in clean, dedicated drums or troughs fitted with gravity drains.

4.7.1 Organic Parameter Equipment Decontamination

Non-dedicated equipment will be cleaned with a brush and non-phosphate detergent-water mixture such that all visible solid matter is removed. A second wash will be performed after the detergent-water wash. For samples requiring organic analyses, non-dedicated equipment will be rinsed with organic-free distilled/deionized water, then rinsed with reagent grade methanol, and finally given a second rinse of organic-free distilled/deionized water. Should tars or other visible organic matter remain on the non-dedicated equipment after the detergent-water wash, a methanol soaked towel will be used to attempt cleanup, and then the full complement of wash procedures repeated. If the non-dedicated equipment retains visible matter after the previously stated actions, the equipment will be retired from the sampling procedures and not used again. Samplers will be reassembled using clean rubber gloves; all decontaminated samplers and sampling tools will be sealed in clean plastic bags pending their next use. All wash and rinse fluids will be transferred to storage drums for short term storage on-site, pending characterization and final disposal at the direction of the Project Manager.

4.7.2 Inorganic Parameter Equipment Decontamination

For samples requiring inorganic analyses, non-dedicated equipment will be rinsed with organic-free distilled/deionized water, then rinsed with a dilute solution of hydrochloric acid, and finally given a second rinse of organic-free distilled/deionized water. Samplers will be reassembled using clean rubber gloves; all decontaminated samplers and sampling tools will be sealed in clean plastic bags pending their next use. All wash and rinse fluids will be transferred to storage drums for short term storage on-site, pending characterization and final disposal at the direction of the Project Manager.

4.7.3 Macroinvertebrate Equipment Decontamination

Equipment decontamination for preparation of the macroinvertebrate tissues will be as specified in the ASTM Standard document (ASTM E2122-02). Sampling and homogenizing equipment will be handled using clean rubber gloves; all decontaminated tools will be sealed in clean plastic bags pending their next use. All wash and rinse fluids will be transferred to dedicated storage containers for short term storage on-site, pending characterization and final disposal at the direction of the Project Manager.

4.8 Calibration Requirements

Calibration of all measuring and test equipment, whether in existing inventory or purchased for this investigation, will be controlled as required by procedure QP-11.1 *Calibration and Maintenance of Measuring and Test Equipment*, or, in the case of portable radiometric survey meters, technical procedures 378-2 and 379-2. Lease equipment will require certifications or other documentation demonstrating acceptable calibration status for the entire period of use for this project. Field calibration requirements will be in compliance with the technical procedure describing the instrument's use and/or with the manufacturer's instructions issued with the equipment.

Method-specific and analytical equipment-specific calibration requirements practiced by individual analytical laboratories selected for subcontract services (Section 2.2 of this QAPP) are addressed within the laboratory QA plans.

5.0 ANALYTICAL PROCEDURES

Tables QAPP-1.1 through QAPP-1.5 cross-references the analytes of interest of this investigation to the standard reference methods and method detection limits that will be established as contractual requirements between Golder and the subcontracted analytical laboratories.

5.1 Field Screening Analytical Procedures

A gamma survey technique will be used to screen area wide soil conditions, test pit locations, or prepared soil aliquots for radioactivity. The gamma survey will utilize portable survey meters to detect gamma emanation from a variety of isotopes. The field tests will define the number of samples selected for collection and/ or compositing actions, and thus will ultimately determine the number of laboratory based analytical tests to be performed. Technical procedures for the use, calibration and calibration check status of field portable instruments are provided in the Appendices. These procedures include:

- Portable Survey Instrument Operability Checks (376-6)
- Calibration Check Of Vendor-Calibrated Portable Survey Meters (378-2)
- Calibration of the Ludlum Scaler Ratemeter (379-2)

Copies of the technical procedures are listed in Table QAPP-2 and full texts are provided in Appendix F of the Remedial Design Work Plan document.

5.2 Laboratory Analytical Procedures

Laboratories selected to support the organic, inorganic and isotope analyses for soil, water, and biota samples, will conform to EPA SW846 methods, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, or radiochemical procedures from The Department of Energy "EML Procedures Manual" as appropriate. Most laboratories have developed their own Standard Operating Procedures (SOPs) associated with the Methods provided in QAPP Tables 1.1 through 1.5. These procedures are acceptable for use provided they are developed in accordance with an established laboratory QA/QC plan that provides precision and bias data meeting EPA acceptance criteria for acceptable data quality. Quality control data must be presented with the analytical data for each Sample Delivery Group submitted to the lab, at a minimum of those QC criteria specified in Section 6.1 of the QAPP. Specific analytical tests may include the following:

5.2.1 Organic Analyses

EPA 8270C	Semivolatiles
EPA 8081A	Organochlorine Pesticides
EPA 8082	Polychlorinated biphenyls

5.2.2 Inorganic Analyses

EPA 200.7 / 6010B	Total and Dissolved Metals
EPA 200.8 / 6020A	Total and Dissolved Metals

EPA 200.9 / 7060 Total and Dissolved Arsenic
EPA 245.1 / 7470A Total and Dissolved Mercury

5.2.3 Radiochemical Analyses

EPA 9310 Gross Alpha and Beta
EPA 9320 Radium-228
EPA 900.0 Gross Alpha and Beta Radioactivity
EPA 901.1 Gamma Emitting Radionuclides
EPA 903.1 Radium-226, Radium Emanation Technique
EPA 904.0 Radium-228
EPA 200.8 ICP/MS for Uranium, Thorium

5.3 Macroinvertebrate Tissue Analysis

The macroinvertebrate tissue sampling will be performed in the field. Preparation procedures for the tissue samples and quality control criteria associated with the sampling and preparation are as stated in the ASTM Method for conducting in-situ field bioassays (ASTM E2122-02). The analytical preparation method for analysis of metal content in tissue will be EPA 3010A; *Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Flame Atomic Absorption or Inductively Coupled Plasma (ICP) Spectroscopy.* EPA Method 6010B for moderate level metal content or EPA Method 6020 for low level metal content will be employed for the analysis of metals in tissue samples. Quality control criteria for tissue preparation will be as outlined in the ASTM method and the laboratory will be responsible for providing appropriate QC data with the analytical data for each Sample Delivery Group of tissue samples submitted to the lab, at a minimum of those QC criteria specified in Section 6.1 of the QAPP.

5.4 5.4 Geotechnical Testing

Geotechnical procedures are identified to support field collection of soil to track soil particle sizing, density tests, and stability issues at the site. ASTM methods represent the procedures to follow in meeting the geotechnical needs. The ASTM methods are presented below and in Table QAPP-1.1, but are presented as reference documents only and are not duplicated in this QAPP.

- C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C535 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- D422 Standard Test Method for Particle-Size Analysis of Soils
- D1140 Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve
- D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

- D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Requirements for Field Gamma Survey Data

Data collection for the gamma survey will be required to determine correlation criteria to the laboratory based analyses for radioactive isotopes of concern. The gamma survey data will include instrument calibration checks, operational checks, survey measurement locations, and the instrument results. Copies of the field data will be routed to the Project Manager for data assessment purposes and to the permanent project records. Details for field gamma survey data reduction, validation, and reporting are provided in Section 3.1 of the Remedial Design Workplan.

6.2 Requirements for Field Biota Data

Data collection for the macroinvertebrate selection and sample processing will be as required according to the ASTM standard procedure (ASTM E2122-02). Copies of the field data will be routed to the Project Manager for data assessment purposes and to the permanent project records. Details for data reduction, validation, and reporting associated with the field biota sample collection and processing are provided in Section 3.1 of the Remedial Design Workplan.

6.3 Requirements for Geotechnical Data

The geotechnical data reduction, validation, and reporting will be as prescribed in the Golder Technical Procedures and in the ASTM procedures referenced in Section 5 of this QAPP. Copies of the data and validation reports will be routed to the Project Manager for data assessment purposes and to the permanent project records.

6.4 Requirements for Laboratory Chemical Analytical Data

All analytical data packages submitted by the analytical laboratories will meet the requirements of a standard laboratory Level III report package. The analytical laboratories include those selected for organic, inorganic, general chemistry, and radiochemical analyses. Most laboratories identify the Level III reporting as a "data validation package", and the major elements of this report package will include the following:

- A case narrative of the data package deficiencies or exceptions, and sample receipt "condition found" record, noting dates of sample receipt, and chain-of-custody documentation;
- Analytical hard copy (paper) results with raw data for each sample containing neat or dilution adjusted results for all analytes/constituents requested on the chain of custody form, request for analysis, or purchase order;
- Analytical quality control results and summary documents for laboratory method blanks, duplicates, laboratory control samples, blank spike/blank spike duplicates, matrix spike/matrix spike duplicates, serial dilutions, surrogates, and internal standards;
- Sample preparation summary data including dates of sample extraction and analysis, analytical methods, and appropriate detection or reporting limits.

All data packages for all analytical parameters will be reviewed and approved by the analytical laboratory's QA Officer prior to submittal for validation.

6.5 General Validation Requirements

All analytical data packages from each sample delivery group will be validated by the detailed review and calculation over-check processes described in *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2002), *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999), and *USEPA Contract Laboratory Program National Functional Guidelines for Low Concentration Organic Data Review* (EPA, 2001). Data validation work will be performed to ensure that the laboratory has met all contractual requirements, all applicable reference method requirements, and the data quality objectives discussed previously in Section 3 and Tables QAPP-1.1 through QAPP-1.5. Validated data will be stored as indicated in procedure TP-2.2-12 *Analytical Data Management* for each sample delivery group. A sample delivery group may be interpreted as a group of twenty samples, or the group of samples delivered to the laboratory in a single week, which ever occurs first.

The data validator will document all contacts made with the laboratory to resolve questions related to the data package. The data validator will prepare a technical report or provide a summary checklist documenting the evaluation of laboratory blanks, field blanks, equipment blanks, duplicates, matrix spikes/matrix spike duplicates, laboratory control samples, calibration data (as applicable for the specified method), and any re-qualification of analytical results required as a result of the validation exercise. The validation report, laboratory contact documentation, copies of the laboratory sample concentration reports, and the as-reviewed laboratory data package will be routed to the Project Manager for data assessment purposes and to the permanent project records.

6.6 Data Assessment Procedures

The data will be validated by project personnel in compliance with EPA guidelines and then reported to the Golder Project Manager. Data assessment will then be performed as described in the Remedial Design Workplan and the White King Pond and Augur Creek Study Workplan. The data will eventually be transferred to EPA in a suitable format.

7.0 QUALITY CONTROL PROCEDURES

All analytical samples will be subject to quality control (QC) measures in both the field and laboratory. The following minimum field quality control requirements apply to all analyses for surface water, groundwater, sediment, and soil samples. These requirements are adapted from *Test Methods for Evaluating Solid Waste* (EPA, 1986; SW-846), as modified by the proposed rule changes included in the *Federal Register* (EPA, 1989).

- Field duplicate samples. Depending on the availability of sufficient sample quantities, field duplicates will be collected at a minimum of one duplicate for each matrix for each period of sampling activity or one duplicate sample for each twenty field samples collected, whichever is more frequent. A "sampling activity period" is identified as one or more field personnel engaged in a specific time of sample collection when one method of sampling is used. The sampling locations for field duplicates are to be determined in the field based upon areas of field identified contaminants, and where volume requirements are sufficient. Duplicate samples will be retrieved from the same sampling location using the same equipment and sampling technique, and will be placed into identically prepared and preserved containers. All field duplicates will be identified with a unique sample designation as specified in Section 4.4 of this QAPP and will be analyzed independently as an indication of gross errors in sampling techniques.
- Equipment blanks. Equipment blanks will consist of pure deionized distilled water washed through decontaminated non-dedicated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks may also include a collection of pure deionized distilled water into collection containers when only dedicated equipment is used. Equipment blanks verify the adequacy of sample containers, non-dedicated sampling equipment decontamination procedures, and the proficiency of the field technician to eliminate fugitive contaminants. The equipment blanks will be collected at a location based upon the potential for the presence of field contaminants and at the same frequency as field duplicate samples.
- Trip blanks. Trip blanks consist of pure deionized distilled water added to one clean volatile organic sample vial, accompanying each batch of samples shipped during a sampling activity or period. It is not anticipated that samples with volatile parameters will be investigated at the sites, and, therefore, trip blanks will not be collected. However, should this circumstance change, the analyses of the trip blank will be at the Project Manager's discretion.

The internal quality control checks performed by the analytical laboratory shall meet the following minimum requirements:

- Matrix spike and matrix spike duplicate samples. Matrix spike and matrix spike duplicate samples require the addition of a known quantity of a representative analyte of interest to the sample as a measure of recovery percentage. The spike shall be made in a replicate of a field sample or field duplicate sample. Replicate samples are separate aliquots removed from the same sample container in the laboratory. Spike compound selection, quantities, and concentrations shall be described in the laboratories analytical procedures. One sample shall be spiked per analytical batch, or once every 20 samples, whichever is greater.

- Quality control reference samples (check samples). A quality control reference sample shall be prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. The quality control reference sample is analyzed after the initial calibration and before any samples are analyzed, and shall be run with every analytical batch, or every 20 samples, whichever is greater. Reference samples are required as an independent check on analytical technique and methodology.

8.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and laboratory that directly affects the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. Golder Associates field equipment that is used for on-site direct measurement or sample acquisition will be subject to the calibration and measurement test procedures as described in Technical procedure QP-11.1 *Calibration and Maintenance of Measuring and Test Equipment.* The subcontracted analytical laboratories will be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions will be incorporated in the laboratory's QA plan.

9.0 DATA MANAGEMENT PLAN

The data management plan addresses the routing and storage of incoming project data.

Laboratory data will be provided to Golder in both hard copy (paper) and electronic format. The paper copy will be routed to the data validator for confirmation of analytical data receipt and subsequent validation activities. The data validator will reserve electronic data until such time as validation actions can be completed and the electronic version of the analytical data updated with qualifier flags as necessary. Validated analytical data packages and diskettes will be routed to the project records for controlled storage, and the validated data will be processed into the analytical database in accordance with guidance in Technical Procedure TP-2.2-12 *Analytical Data Management*. The following items associated with analytical data may be included as deliverables for inclusion into the project archives:

- Analytical data packages and analytical quotes
- Electronic versions of the data package by diskette, or e-mail delivery
- Correspondence with the laboratory by e-mail, telecom, or facsimile transmission associated with analytical data package issues
- Chain of custody and shipping documentation
- Copies of technical field logs and field reports.

10.0 REFERENCES

APHA, 1989, *Standard Methods for the Examination of Water and Wastewater*, 20th Ed.

ASTM D4557-85 *Standard Practice for Collecting Benthic Macroinvertebrates with Surber and Related Type Samplers*, Annual Book of ASTM Standards, Vol 11.02, 1994.

ASTM E2122-02 Standard Guide for Conducting In-situ Field Bioassays With Caged Bivalves, ASTM Book of Standards, Volume 11.05, Subcommittee, E47.01.

ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C535 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

ASTM D1140 Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve

ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

DOE, 4.5.2.3 *Gamma Ray Spectrometry*, EML Procedures Manual, US Department of Energy, 27th Edition, Volume 1, 1990.

EPA, 1979, *Methods for the Chemical Analysis of Water and Waste*, EPA-600/4-79-020.

EPA, 1986, *Test Methods for Evaluating Solid Waste*, SW-846.

EPA, 1989, *Federal Register*, Volume 54, No. 13.

EPA, 1998, *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, (EPA/600/R-98/018), February.

EPA, 1999, *USEPA Contract Laboratory Program Statement of Work for Organics*, OLM04.2, August.

EPA, 1999, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, OSWER 9240.1-05A-P, PB99-963506, (EPA-540/R-99-008), October.

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EPA, 2002, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER 9240.1-35, (EPA 540-R-01-008), July.

EPA 1989. *Rapid Bioassessment Protocols for Use in Streams and Rivers - Benthic Macroinvertebrates and Fish*, EPA/440/4-89/001.

EPA 900.0 *Gross Alpha and Gross Beta Radioactivity, Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, August, 1980.

EPA 901.1 *Gamma Emitting Radionuclides, Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, August, 1980.

EPA 903.1 *Radium 226 – Radon Emanation Technique, Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, August, 1980.

EPA 904.0 *Radium 228, Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, August, 1980.

EPA 200.8 *Determination of Trace Elements in Waters and Wastes by ICP/MS*, Environmental Monitoring Systems Laboratory, Office of Research and Development, US EPA, Cincinnati, Ohio, Revision 5.4

EPA 3010A "Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Flame Atomic Absorption or Inductively Coupled Plasma (ICP) Spectroscopy", *Test Methods for Evaluating Solid Waste*, SW-846.

TABLES

TABLE QAPP-1.1
RADIOMETRIC ANALYSES
Soil and Water Quality Criteria

Name	Symbol	Type	Method	MDA and MDL[c]
Gross alpha activity	--	Water	EPA 9310[a] / 900.0[b]	15 pCi/L
Gross beta activity	--	Water	EPA 9310[a] / 900.0[b]	50 pCi/L
Radium 226	Ra-226	Water	EPA 9320[a] / 903.1[b]	1 pCi/L
Radium 228	Ra-228	Water	EPA 9320[a] / 904.0[b]	1 pCi/L
Potassium 40	K-40	Water	Gamma Spectroscopy (901.1)	Lab Specific
Thorium 232	Th-232	Water	EPA 200.8[d]	0.00002 mg/L
Uranium 234	U-234	Water	Gamma Spectroscopy (901.1)	Lab Specific
Uranium 238	U-238	Water	EPA 200.8[d]	0.00005 mg/L

Notes:
a - USEPA Methods from SW-846 *Test Methods for Evaluating Solid Wast* e.
b - EPA Methods from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* August 1980.
c - MDA, Minimum Detectable Activity: pCi/L = pico Curie per Liter; MDL, Method Detection Limit: mg/L = milligram per Liter.
d - EPA Method 200.8 *Determination of Trace Elements in Waters and Wastes by ICP/MS,* Rev. 5.4.

Name	Symbol	Type	Method	MDA[b] and MDL[c]
Radium 226	Ra-226	Soil	EPA 9320[a]/ Gamma Spec	0.1 pCi/gm
Radium 228	Ra-228	Soil	EPA 9320[a]/ Gamma Spec	0.2 pCi/gm
Potassium 40	K-40	Soil	Gamma Spectroscopy	Lab Specific
Thorium 232	Th-232	Soil	EPA 200.8[d]	0.05 ug/gm
Uranium 234	U-234	Soil	Gamma Spectroscopy	Lab Specific
Uranium 238	U-238	Soil	EPA 200.8[d]	1 ug/gm

Notes:
a - USEPA Methods from SW-846 *Test Methods for Evaluating Solid Wast* e.
b - MDA, Minimum Detectable Activity: pCi/gm = pico Curie per gram.
c - MDL, Laboratory Method Detection Limits: ug/gm = microgram per gram.
d - EPA Method 200.8 *Determination of Trace Elements in Waters and Wastes by ICP/MS,* Rev. 5.4.

TABLE QAPP -1.2
METALS
Soil and Water Quality Criteria

Analytes[aa]	CAS #	Method[a]	CLP Inorganics ILM04.0 CRQL[e] Water	Laboratory Water PQL[c]	Laboratory Soil PQL[c]
			ug/L	ug/L	mg/Kg
Aluminum	7429-90-5	200.7 / 6010B	200	100	
Antimony	7440-36-0	200.9 / 6010B	60	3[b]	10
Arsenic	7440-38-2	200.9 / 6010B	10	5	2
Barium	7440-39-3	200.7 / 6010B	200	5	1
Beryllium	7440-41-7	200.7 / 6010B	5	2	0.4
Cadmium	7440-43-9	200.9 / 6010B	5	0.5	1
Calcium	7440-70-2	200.7 / 6010B	5000	1000	1.3
Chromium	7440-47-3	200.7 / 6010B	10	10	2
Cobalt	7440-48-4	200.7 / 6010B	50	5	1
Copper	7440-50-8	200.9 / 6010B	25	5	2
Iron	7439-89-6	200.7 / 6010B	100	100	
Lead	7439-92-1	200.9 / 6010B	3	1[b]	2
Magnesium	7439-94-4	200.7 / 6010B	5000	1000	
Manganese	7439-96-5	200.7 / 6010B	15	5	
Mercury	7439-97-6	245.1 / 7470A	0.2	0.2	0.02
Nickel	7440-02-0	200.7 / 6010B	40	10	8
Potassium	7440-50-8	200.7 / 6010B	5000	1000	
Selenium	7782-49-2	200.9 / 6010B	5	2[b]	10
Silver	7440-22-4	200.9 / 6010B	10	1	2
Sodium	7440-23-5	200.7 / 6010B	5000	1000	
Thallium	7440-28-0	200.9 / 6010B	10	1[b]	2
Vanadium	7440-62-2	200.7 / 6010B	50	10	1
Zinc	7440-66-6	200.7 / 6010B	20	10	2

Notes:
aa - Target Analyte List (TAL) Metals, from *CLP Inorganic Analytical Statement of Work* , ILM04.0.
a - *Methods for Chemical Analysis of Water & Wastes* / SW-846 analytical methods.
b - Method Detection Limit is given.
c - PQL; Practical Quantitation Limit established by the laboratory.
e - CRQL, Contract Required Quantitation Limit.

TABLE QAPP - 1.3
GENERAL CHEMISTRY
Soil and Water Quality Criteria and Field Parameter Summary

Type	Analytes	CAS #	Method[a]	Laboratory Water MDL[b]	Inorganics ILM04.0 CRQL[c] Water	Laboratory Soil MDL[b]
				ug/L	ug/L	mg/Kg
Miscellaneous	Cyanide, (Total)	57-12-5	EPA 335.2	50	10	1
Wet Chemistry	Cation Exchange Capacity	-	EPA 9081	-	-	0.005 meq/gm
Wet Chemistry	Alkalinity (CaCO3)	-	EPA 310.2	100 ($CaCO_3$)	-	-
	Ammonia as N	-	EPA 350.3	100		
Wet Chemistry	Chloride	-	EPA 300.0	200	-	-
Wet Chemistry	Fluoride	-	EPA 300.0	100	-	-
Wet Chemistry	Nitrate	-	EPA 300.0	50	-	-
Wet Chemistry	Nitrite	-	EPA 300.0	50	-	-
	Ortho- Phosphate	-	EPA 300.0	200	-	-
Wet Chemistry	Sulfate	-	EPA 300.0	300	-	-
Wet Chemistry	Sulfide	-	EPA 376.1	1000	-	-
Wet Chemistry	Carbonate	-	SM2320B	20	-	-
Wet Chemistry	Bicarbonate	-	SM2320B	20	-	-
Wet Chemistry	Total Dissolved Solids	-	EPA 160.1	10 mg/L	-	-
Wet Chemistry	Total Suspended Solids	-	EPA 160.2	10 mg/L	-	-
Wet Chemistry	Total Organic Carbon	-	EPA 415.1 / 9060	1000	-	-
	Analytes		Field Method	Sensitivity		
Field Parameter	pH	-	EPA 150.1	0.05 units	-	-
Field Parameter	Specific Conductance	-	EPA 120.1	5 mhos	-	-
Field Parameter	Dissolved Oxygen	-	EPA 360.1	1 mg/L	-	-
Field Parameter	Temperature	-	S.M. 2550	0.5 units	-	-
Field Parameter	Oxidation Reduction (Eh)	-	S.M. 2580	+/- 10 mV	-	-
Field Parameter	Turbidity	-	EPA 180.1	1 NTU	-	-

NOTES:
a - *Methods for Chemical Analysis of Water & Wastes*, *Standard Methods*, and SW-846 analytical methods.
b - MDL: Method Detection Limit.
c - CRQL, Contract Required Quantitation Limit.

TABLE QAPP-1.4
SEMI-VOLATILE
Soil and Water Quality Criteria

Type	Analytes[a]	CAS #	Method[b]	Laboratory Water RL[c] ug/L	CLP Organics OLM04.2 CRQL[c] Water ug/L	CLP Organics OLM04.2 CRQL[c] Soil mg/Kg
Acids	2,4,5-Trichlorophenol	95-95-4	8270C	10	25	0.83
Acids	2,4,6-Trichlorophenol	88-06-2	8270C	10	10	0.33
Acids	2,4,Dinitrophenol	51-28-5	8270C	10[d]	25	0.83
Acids	2,4-Dichlorophenol	120-83-2	8270C	10	10	0.33
Acids	2,4-Dimethylphenol	105-67-9	8270C	10	10	0.33
Acids	2-Chlorophenol	95-57-8	8270C	10	10	0.33
Acids	2-Nitrophenol	88-75-5	8270C	10	10	0.33
Acids	4,6-Dinitro-o-cresol	534-52-1	8270C	50	25	0.83
Acids	4-Nitrophenol	100-02-7	8270C	0.1	25	0.83
Acids	2-Methylphenol, (o-Cresol)	95-48-7	8270C	10	10	0.33
Acids	p-Chloro-m-cresol, (4-chloro-3-methyl phenol)	59-50-7	8270C	10	10	0.33
Acids	4-Methylphenol, (p-Cresol)	106-44-5	8270C	10	10	0.33
Acids	Pentachlorophenol	87-86-5	8270C	0.1	25	0.83
Acids	Phenol	108-95-2	8270C	10	10	0.33
Base/Neutral	2,2'-oxybis(1-chloropropane)	108-60-1	8270C	10	10	0.33
Base/Neutral	2,4-Dinitrotoluene	121-14-2	8270C	10	10	0.33
Base/Neutral	2,6-Dinitrotoluene	606-20-2	8270C	10	10	0.33
Base/Neutral	2-Chloronaphthalene, (beta-chloronaphthalene)	91-58-7	8270C	10	10	0.33
Base/Neutral	2-Methylnaphthalene	91-57-6	8270C	10	10	0.33
Base/Neutral	2-Nitroaniline	88-74-4	8270C	50	25	0.83
Base/Neutral	3,3-Dichlorobenzidine	91-94-1	8270C	50	10	0.33
Base/Neutral	3-Nitroaniline	99-09-2	8270C	50	25	0.83
Base/Neutral	4-Bromophenyl phenyl ether	101-55-3	8270C	10	10	0.33
Base/Neutral	4-Chloroaniline	106-47-8	8270C	10	10	0.33
Base/Neutral	4-Chlorophenyl phenyl ether	7005-72-3	8270C	10	10	0.33
Base/Neutral	4-Nitroaniline	100-01-6	8270C	50	25	0.83
Base/Neutral	Acenaphthene	83-32-9	8270C	10	10	0.33
Base/Neutral	Acenaphthylene	208-96-8	8270C	10	10	0.33
Base/Neutral	Acetophenone	98-86-2	8270C	10	10	0.33
Base/Neutral	Anthracene	120-12-7	8270C	10	10	0.33
Base/Neutral	Benzo(a)anthracene	56-55-3	8270C	0.01[e]	10	0.33
Base/Neutral	Benzo(a)pyrene	50-32-8	8270C	10	10	0.33
Base/Neutral	Benzo(b)fluoranthene	205-99-2	8270C	10	10	0.33
Base/Neutral	Benzo(g,h,i)perylene	191-24-2	8270C	10	10	0.33
Base/Neutral	Benzo(k)fluoranthene	207-08-9	8270C	10	10	0.33
Base/Neutral	bis(2-chloroethoxy)methane	111-91-1	8270C	10	10	0.33
Base/Neutral	bis(2-chloroethyl)ether	111-44-4	8270C	10	10	0.33

TABLE QAPP-1.4
SEMI-VOLATILE
Soil and Water Quality Criteria

Type	Analytes[aa]	CAS #	Method[a]	Laboratory Water RL[b] ug/L	CLP Organics OLM04.2 CRQL[c] Water ug/L	CLP Organics OLM04.2 CRQL[c] Soil mg/Kg
Base/Neutral	bis(2-ethylhexyl)phthalate, (DEHP)	117-81-7	8270C	2[d]	10	0.33
Base/Neutral	Butyl benzyl phthalate	85-68-7	8270C	10	10	0.33
Base/Neutral	Chrysene	218-01-9	8270C	0.01[e]	10	0.33
Base/Neutral	Dibenz[a,h]anthracene	53-70-3	8270C	10	10	0.33
Base/Neutral	Dibenzofuran	132-64-9	8270C	10	10	0.33
Base/Neutral	Diethyl phthalate	84-66-2	8270C	10	10	0.33
Base/Neutral	Dimethyl phthalate	131-11-3	8270C	10	10	0.33
Base/Neutral	Di-n-butyl phthalate	84-74-2	8270C	10	10	0.33
Base/Neutral	Di-n-octylphthalate	117-84-0	8270C	10	10	0.33
Base/Neutral	Fluoranthene	206-44-0	8270C	10	10	0.33
Base/Neutral	Fluorene	86-73-7	8270C	10	10	0.33
Base/Neutral	Hexachlorobenzene	118-74-1	8270C	10	10	0.33
Base/Neutral	Hexachlorobutadiene	87-68-3	8270C	10	10	0.33
Base/Neutral	Hexachlorocyclopentadiene	77-47-4	8270C	50	10	0.33
Base/Neutral	Hexachloroethane	67-72-1	8270C	10	10	0.33
Base/Neutral	Indeno[1,2,3-cd]pyrene	193-39-5	8270C	10	10	0.33
Base/Neutral	Isophorone	78-59-1	8270C	10	10	0.33
Base/Neutral	Naphthalene	91-20-3	8270C	10	10	0.33
Base/Neutral	Nitrobenzene	98-95-3	8270C	10	10	0.33
Base/Neutral	N-Nitrosodi-n-propylamine	621-64-7	8270C	10	10	0.33
Base/Neutral	N-Nitrosodiphenylamine	86-30-6	8270C	10	10	0.33
Base/Neutral	Phenanthrene	85-01-8	8270C	10	10	0.33
Base/Neutral	Pyrene	129-00-0	8270C	10	10	0.33

Notes:
aa - Target Compound List analytes, from *Contract Laboratory Program (CLP) Organic Analytical Statement of Work* (OLM04.2).
a - USEPA Methods from SW-846.
b - Reporting Limits are Practical Quantitation Limits (PQL) unless otherwise noted, established by participating laboratory.
c - CRQL, Contract Required Quantitation Limit.
d - Laboratory reporting limit is a Method Detection Limit (MDL) established annually for each instrument.
Values are qualified as estimated up to 5 times the indicated number.
e - Laboratory reporting limit is established by special sample preparation procedures. Matrix interferences may render this reporting limit unachievable. Values reported are qualified as estimated up to a laboratory PQL of 10 ug/L.

TABLE QAPP -1.5
PESTICIDE/ PCBs
Soil and Water Quality Criteria

Analytes[aa]	CAS #	Method[a]	Laboratory Water PQL[b]	CLP Organics OLM04.2 CRQL[c] Water	Laboratory Soil PQL[b]	CLP Organics OLM04.2 CRQL[c] Soil
			ug/L	ug/L	mg/Kg	mg/Kg
4,4'-DDD	72-54-8	8081A	0.02	0.1	0.002	0.0033
4,4'-DDE	72-55-9	8081A	0.02	0.1	0.002	0.0033
4,4'-DDT	50-29-3	8081A	0.02	0.1	0.002	0.0033
Aldrin	309-00-2	8081A	0.01	0.05	0.001	0.0017
alpha-BHC	319-84-6	8081A	0.01	0.05	0.001	0.0017
beta-BHC	319-85-7	8081A	0.01	0.05	0.001	0.0017
delta-BHC	319-86-8	8081A	0.01	0.05	0.001	0.0017
Dieldrin	60-57-1	8081A	0.02	0.1	0.002	0.0033
Endosulfan I	959-98-8	8081A	0.01	0.05	0.001	0.0017
Endosulfan II	33213-65-9	8081A	0.02	0.1	0.002	0.0033
Endosulfan sulfate	1031-07-8	8081A	0.02	0.1	0.002	0.0033
Endrin	72-20-8	8081A	0.02	0.1	0.002	0.0033
Endrin aldehyde	7421-93-4	8081A	0.02	0.1	0.002	0.0033
gamma-BHC, (lindane)	58-89-9	8081A	0.01	0.05	0.001	0.0017
Heptachlor	76-44-8	8081A	0.01	0.05	0.001	0.0017
Heptachlor epoxide	1024-57-3	8081A	0.01	0.05	0.001	0.0017
Methoxychlor	72-43-5	8081A	0.1	0.5	0.01	0.017
Toxaphene	8001-35-2	8081A	1	5	0.1	0.17
Aroclor 1016	12674-11-2	8082	0.1	1	0.01	0.033
Aroclor 1221	11104-28-2	8082	0.2	2	0.02	0.067
Aroclor 1232	11141-16-5	8082	0.1	1	0.01	0.033
Aroclor 1242	53469-21-9	8082	0.1	1	0.01	0.033
Aroclor 1248	12672-29-6	8082	0.1	1	0.01	0.033
Aroclor 1254	11097-69-1	8082	0.1	1	0.01	0.033
Aroclor 1260	11096-82-5	8082	0.1	1	0.01	0.033

Notes:
aa - Target Compound List analytes from *Contract Laboratory Program (CLP) Organic Analytical Statement of Work* (OLM04.2).
a - USEPA Methods from SW-846.
b - Reporting Limits are Practical Quantitation Limits (PQL) unless otherwise noted, established by participating laboratory.
c - CRQL, Contract Required Quantitation Limit.

TABLE QAPP-2

Golder Technical and Quality Control Procedures

TP 1.1-14	Land Seismic Refraction Survey
TP 1.2-2	Geotechnical Rock Core Logging
TP-1.2-6	Field Identification of Soil
TP 1.2-17	Rising Head Slug Test
TP-1.2-18	Sampling Surface Soil for Chemical Analysis
TP-1.2-21	Geotechnical Test Pit Logging and Sampling
TP-1.2-23	Chain of Custody
TP-1.2-26	Surface Water Sampling Methods
TP-1.3-1	Geologic Mapping of Soils in Test Pits
TP-1.4-6a	Manual Groundwater Level Measurement
TP-2.2-12	Analytical Data Management
TP-8.2-3	Sediment Sampling
TP-8.6-1	Benthic Invertebrate Sampling Procedures
QP-11.1	Calibration and Maintenance of Measuring and Test Equipment
QP-14.1	Corrective and Preventive Action
QP-16.1	Quality Assurance Records Management

TABLE QAPP-2 (continued)

Other Technical and Quality Control Procedures

223	GPS Calibration
224	GPS Operation
376-6	Portable Survey Instrument Operability Checks
378-2	Calibration Check of Vendor-Calibrated Portable Survey Meters
379-2	Calibration of the Ludlum Scaler Ratemeter, Model 2221

ASTM Technical Procedures for Biota

D4557-85 Standard Practice for Collecting Benthic Macroinvertebrates with Surber and Related Type Samplers

E2122-02 Standard Guide for Conducting In-situ Field Bioassays With Caged Bivalves

TABLE QAPP-3

Surface & Groundwater Sample Container Types, Volumes, Handling, Preservation, and Holding Times

Analytes	Container Type	Special Handling	Preservation	Maximum Holding Time
Radiochemical Compounds	1, 1000 mL narrow mouth polyethylene bottle	Fill to Neck..	HNO_3, pH < 2, store at <4°C.	6 months
Semi volatile Organic Compounds	1, 1,000 mL narrow mouth amber glass bottles, teflon-lined cap.	Fill to neck, (Collect an additional 1,000 mL aliquot for MS/MSD analysis if required)	None. Store in dark at <4°C.	14 days for extraction, 40 days for analysis after extraction
Pesticide/PCBs	1, 1,000 mL narrow mouth amber glass bottles, teflon-lined cap.	Fill to neck, (Collect an additional 1,000 mL aliquot for MS/MSD analysis if required)	None. Store in dark at <4°C.	14 days for extraction, 40 days for analysis after extraction
pH, Temperature, Ox-Redox, Conductivity, Dissolved Oxygen, Turbidity	Field Parameters; Sample is not collected	Field Parameters; Sample is not collected	Field Parameters; Sample is not collected	Field Parameters; Sample is not collected
Alkalinity, Chloride, Sulfate, Total Dissolved Solids, Total Organic Carbon	1, 1000 mL narrow mouth polyethylene bottle	Fill to neck	Alk., Cl, SO4, TDS; None, store at <4°C TOC; HCl to pH <2	TDS, 7 days Alk.; 14 days Cl, SO4, TOC;, 28 days
Dissolved Metals, Mercury	1, 1000 mL narrow mouth polyethylene bottle.	Filter through 0.45 um membrane filter, fill to neck.	HNO_3, pH < 2, store at <4°C.	6 months, (28 day, Hg)
Total Metals, Mercury	1, 1000 mL narrow mouth polyethylene bottle.	Fill to neck	None, store at <4°C	6 months, (28 day, Hg)

TABLE QAPP-4

Soil & Sediment Sample Container Types, Volumes, Handling, Preservation, and Holding Times

Analytes	Container Type	Special Handling	Preservation	Maximum Holding Time
Radiochemical Compounds	1, 4 oz. Wide mouth soil jar	Fill completely	None, store in dark at 4°C.	6 months
Semi volatile Organic Compounds	1, 4 oz. Wide mouth soil jar	Fill completely	None, store in dark at 4°C.	14 days for extraction, 40 days for analysis after extraction
Pesticide/PCBs	1, 4 oz. Wide mouth soil jar	Fill completely	None, store in dark at 4°C.	14 days for extraction, 40 days for analysis after extraction
Metals	1, 4 oz. Wide mouth soil jar	Fill completely	None, store in dark at 4°C.	6 months
Mercury	1, 4 oz. Wide mouth soil jar	Fill completely	None, store in dark at 4°C.	28 days